

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Master Schedule and Overview
WBS: All
Date Submitted: 5/25/00
Submitted By: Harry Weerts, Bill Freeman

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	M2-Central Preshower Module Fabrication Complete	12/16/97	12/16/97	0 w
X	M2-Central Preshower Installed on Solenoid	5/21/98	5/21/98	0 w
X	M3-Level Ø-South Installed	5/8/00	2/9/00	12.6 w
	M2-Muon End Toroids Installed on Platform	7/27/00	11/15/00	-15.4 w
	M1-Begin Shield Wall Removal/Ready to Roll-in	11/1/00	11/22/00	-3 w
	M1-Detector Rolled-in and Hooked Up	2/1/01	2/2/01	-0.2 ww

Note: the full set of reportable milestones are collected and sorted by date at the end of this report.

Areas of Concern

Technical

Refer to the WBS level 3 system reports.

Schedule

The principal area of schedule concern remains the silicon tracker. We have established fallback plans to assure ourselves that we will be able to start the run with a viable physics detector. These plans have been presented to the Lab. An area of increasing concern is the timely availability of tracking electronics. While this is unlikely to affect the detector roll-in (because in many cases it can be added after the detector has rolled in), it may have an impact on the timely commissioning of the tracker detector subsystems.

As expected, numerous problems continue to crop up, with potential impact on the schedule. We still anticipate the full completion of the detector before the start of Run II in March, 2001, and we continue to refine the installation schedule to accomplish this.

Resources

None

Cost

Through April we have obligated \$3.1M. We now have in place forward funding to assure ourselves of uninterrupted obligation authority to keep the project on schedule.

Change Requests

None

Progress Summary

All systems are well along in production, including all of the large systems (Silicon, Fibers, Muons) and some have completed construction (forward muon pixels). Some of the smaller forward detectors (FPS, ICD, and luminosity monitor) have been completed and are being installed. The mechanical construction of the fiber tracker is nearing completion. All of this has led to a significant increase of activity in the DØ assembly hall. Commissioning activities are well underway with all components of the new DAQ system. For more details see the enclosed subsystem reports.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Solenoid
WBS: 3.1.1
Date Submitted: 5/24/00
Submitted By: Gene Fisk

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	M1-Solenoid Delivered to Fermilab	5/12/97	5/12/97	0 w
X	M1-Solenoid Installed and Tested	9/30/98	9/30/98	0 w

Areas of Concern

Technical

None

Schedule

None

Resources

None

Cost

None

Change Requests

The Particle Physics Division and the DØ Project Department signed the solenoid project "Notice of Project Closing" on May 4, 2000. A request has been submitted to transfer the remaining funds from the solenoid project to the DØ detector equipment upgrade project.

Progress Summary

The solenoid project is complete and was delivered on time. This represents the last monthly report that will be submitted for the solenoid project.

- The superconducting magnet has been operated at Fermilab/DØ as necessary during commissioning tests on three separate occasions from periods of a week to two months. It operates very well and is a credit to the designers and builders here at Fermilab and at Toshiba's Keihin Works in Yokohama, Japan.
- The Be beam tube has passed final inspection by the Fermilab Beams Division and is fully qualified for installation in our detector and accelerator.
- The solenoid project-closing directive cost-to-complete totaled \$4,885,593.64 out of authorized funding of \$5,168,000.00, thus leaving a balance of \$282,406.36. A request has been submitted to transfer the remainder of project funding to the equipment budget authorization for other parts of the DØ detector upgrade.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Silicon Tracker
WBS: 1.1.1
Date Submitted: 5/16/00
Submitted By: Marcel Demarteau, Ron Lipton

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	H Half-Wedge Fabrication 20% Complete	10/15/99	10/15/99	0 w
X	3 Chip Ladder Fabrication 80% Complete	10/26/99	10/20/99	0.6 w
X	9 Chip Ladder Fabrication 20% Complete	11/4/99	11/3/99	0.2 w
X	F Wedge Assemblies 20% Complete	1/24/00	1/19/00	0.4 w
X	6 Chip Ladder Fabrication 20% Complete	1/31/00	1/3/00	3.9 w
X	H Half-Wedge Fabrication 80% Complete	3/29/00	2/23/00	5 w
	F Wedge Assemblies 80% Complete	6/20/00	4/26/00	7.6 w
	9 Chip Ladder Fabrication 80% Complete	6/27/00	3/27/00	13 w
	M2-First Silicon Tracker Barrel/Disk Module Complete	6/28/00	1/24/00	22.2 w
	6 Chip Ladder Fabrication 80% Complete	7/12/00	3/14/00	16.8 w
	South H-Disks Ready to Move to DAB	8/4/00	7/3/00	4.6 w
	South Half-Cylinder Complete and Ready to Move to DAB	8/10/00	8/1/00	1.6 w
	M3-All Silicon Tracker Barrels/Disks Complete	10/27/00	8/25/00	9 w
	North Half-Cylinder Complete and Ready to Move to DAB	10/27/00	9/18/00	6 w
	M1-Central Silicon Complete	10/27/00	9/18/00	6 w
	M2-Silicon Tracker Installed in Solenoid/Fiber Tracker	12/19/00	9/25/00	12 w

Areas of Concern

Technical

- During barrel assembly we found that proper ground contacts were not being made from the 3-chip ladder electronics to the beryllium support bulkhead. Assembly was paused to investigate the best technique to make those connections. In addition, ground contacts were found to be unreliable due to oxide which forms on the beryllium. We have now found candidate techniques that can be used to make more reliable connections. There are very small spaces available to make these connections on ladders that have already been installed. We will first make connections on installed ladders that would be blocked by ladders yet to be installed. The final ladders will be installed with proper grounding. Ladders already in place will be grounded after the barrel is completed.
- HDI assembly continues to have problems related to overheating or mistreatment of parts being assembled at outside vendors.
- We have found that encapsulation of wirebonds has, in some cases, lead to lost channels in the detector due to damaged bonds. Devices with substantial problems are being rebonded.
- Tests of final prototypes of the full readout system including low-mass cables and interface cards are in progress. The system is being optimized to minimize clock skew and insure proper termination and grounding.

Schedule

- Delivery of 90-degree sensors from Micron Semiconductor continues to be a concern. Only seven sensors were delivered in April due to holidays in England. Production is paced by delivery of these devices. We expect thirty sensors in May. We are also concerned that there are not enough devices in the pipeline at Micron to complete our order. In that case we may have to take sensors with higher values of the bias resistor.
- Assembly of 9-chip HDIs is pacing detector production for layers 2 and 4. We need to process bare HDIs into tested electronics packages as quickly as possible. This process includes testing at Fresno State, lamination at Fermilab, assembly at Promex, and testing at Fresno State.
- May and June should include substantial production of H-wedge, F-wedge 9 chip and 6 chip assemblies. Production and testing facilities will be taxed during this period.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Resources

We continue to be concerned about the number of mechanical and electrical engineering resources we will have during the upcoming systems integration phase for the DØ SMT. We need to maintain a sustained effort in spite of some losses of engineering and visiting scientist effort.

Cost

None

Change Requests

None

Progress Summary

- We have begun assembly of the first sets of barrels and disks. The first barrel is almost complete and assembly of the second is underway in a parallel setup. With the exception of the grounding problems mentioned above, assembly has gone smoothly, with good mechanical alignment of the installed ladders. First disk assembly has also gone smoothly, and it is expected that installation and alignment of a disk can be completed in a week. Production of sub-assemblies is concentrating on assembling and testing enough ladders and wedges to complete the first half-cylinder.
- The full support cylinder was assembled, measured and tested, and cut into two half-cylinders. Final fit-up in the fiber tracker will be done after cable slots are cut.
- H disk full-wedge assembly is underway and the first set of detector modules have been installed in the H-disk beryllium support.
- We have completed tests of the first prototype interface card. A set of fifteen cards to be used in the 10% test should be available in June. We have solved problems in SVX operation that arose during the first phase of cosmic ray testing and are now proceeding to install the infrastructure needed to operate a full barrel/disk module for the 10% test.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Fiber Tracker and VLPCs
WBS: 1.1.2
Date Submitted: 5/8/00
Submitted By: Alan D. Bross

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
	<i>Detector</i>			
X	M2 - Assembly Design Complete	3/5/99	3/5/99	0 w
X	M2-First Cylinder Complete	9/2/99	9/2/99	0 w
X	M3-Fiber Tracker Ribbon Fabrication 50% Complete	11/5/99	11/12/99	-0.9 w
X	M2-Fiber Tracker Assembly Begun	2/1/00	12/6/99	6.2 w
X	M3-Fiber Tracker Cylinders 8, 7, 6, and 5 Complete	3/2/00	1/28/00	5 w
	Waveguide Production 50% Complete	3/16/00	1/29/00	6.8 w
X	M3-Fiber Tracker Ribbon Fabrication Complete	5/10/00	3/6/00	9.5 w
X	M3-Fiber Tracker Ribbon Mounting Complete	5/13/00	4/20/00	3.3 w
	M2-Fiber Tracker Assembly Complete	5/24/00	5/4/00	2.9 w
	M3-Waveguide Production Complete	8/2/00	6/5/00	8.4 w
	<i>VLPCs</i>			
X	M2-VLPC Production 50% Complete	8/31/97	8/31/97	0 w
	M3-VLPC Cassette Assembly 50% Complete	6/5/00	4/12/00	7.4 w
	M3-VLPC Cryo System Operational	7/7/00	6/12/00	3.6 w
	M3-VLPC Cassette Assembly Complete	10/13/00	8/22/00	7.4 w

Areas of Concern

Technical

None

Schedule

None

Resources

None

Cost

None

Change Requests

None

Progress Summary

- Ribbon fabrication complete.
- Ribbons mounted on cylinders 2 through 8.
- Cylinders 3 through 8 nested.
- VLPC flex circuit deliveries coming in on schedule (approx. 600 on hand).
- Production cassettes 1 through 7 complete.
- Waveguide connectorization has begun.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Forward Preshower
WBS: 1.1.4
Date Submitted: 5/3/00
Submitted By: Abid Patwa

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	M2-Forward Preshower Module Fabrication Begun	11/4/98	11/4/98	0 w
X	M3-1st Forward Preshower Detector Complete	2/24/00	1/12/00	6.2 w
X	Module Fabrication and Testing Complete	4/1/00	12/10/99	14 w
X	M3-2nd Forward Preshower Detector Complete	4/3/00	3/8/00	3.6 w

Areas of Concern

Technical

None

Schedule

None

Resources

None

Cost

None

Change Requests

None

Progress Summary

- Machining of all remaining mounting elements which support the FPS detectors on the EC cryostat heads at DØ was completed at the Stony Brook and Brookhaven shops. These elements were subsequently shipped to Fermilab.
- Both FPS south and north completed detectors were packaged and delivered from Brookhaven to Fermilab during the 2nd week of April.
- The detectors were successfully installed and aligned on their respective EC south and north heads during the last two weeks of April. This included welding of all supporting hardware on the cryostat heads for FPS (and inner perimeter of ICD) detectors.
- Each layer of FPS was properly surveyed in parallel to detector assembly on the EC heads. The full collection of survey data is presently being analyzed to determine the precise location of FPS within the DØ global reference frame.
- Two to three spare modules continue to be cabled, LED response calibrated, and quality inspected at BNL to make available during future engineering, commissioning related work at DØ.
- Plans for staging the FPS waveguide routing and installation on the EC head using a prototype cable continues to be developed. The actual staging is expected to be done the 1st or 2nd week of May, following the ICD and Luminosity Monitor installation at DØ.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Tracking Electronics
WBS: 1.1.5
Date Submitted: 5/24/00
Submitted By: Marvin Johnson, Fred Borcharding

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	First Readout Crate Installed & Working	11/16/99	12/2/99	-2 w
	Multichip Modules Received	6/1/00	2/23/00	14 w
	Ten 8-chip Analog Boards Available	6/29/00	4/19/00	10 w
	10 Digital Boards Available	8/11/00	3/22/00	20 w
	Mixer Boards Ready	11/3/00	6/22/00	18.8 w

Areas of Concern

Technical

None

Schedule

Multi chip modules will not be delivered by June 1. The production test fixture is not yet fully operational. Estimate about four weeks of delay. The ten analog front-end boards are also about three weeks behind.

Resources

None

Cost

None

Change Requests

None

Progress Summary

- All silicon electronics boards have been delivered except the interface cards and the cable adapter cards. Fifteen interface cards will be delivered by June 1, and about forty cable adapter cards are already in hand. The interface card design requires some modifications. These should be completed by June 1.
- Data has been readout from the VRB using production VRB controllers. Some small problems in the firmware were uncovered. These problems should be fixed by the end of May.
- One VRB emulator board is complete and a second prototype should be finished by the end of May. The cable plant design is started and should be completed in May.
- AFE prototype testing continued. The noise characteristics for the discriminator are now within specifications when running at 396nsec. Work will continue to get the SVX readout within specifications and then we will turn to 132nsec operation.
- Extensive work was done on the MCM production testing. The board was debugged and work is nearing completion on the test software.
- The 8-MCM AFE board layout was received from the vendor with no major problems found. We are, however, making major changes to this layout with our ESE personnel to incorporate the noise information from the AFE prototype testing. Layout of the two-board pair for the 12-MCM AFE also proceeded smoothly during the month.
- Work on the mixer box design continued. The special design tool was in use. Other details of the design such as the clock distributions, handling of the control bits and synchronization of the system were worked on. The system is near design completion.
- Digital boards are out for production. First article cables for the digital system were received.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Calorimeter Electronics
WBS: 1.2.1
Date Submitted: 5/3/00
Submitted By: Mike Tuts

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	SCA Testing Complete	11/23/99	12/15/99	-2.8 w
X	Shaper Hybrid 50% Complete	2/22/00	5/9/00	-11.1 w
	M2-Calorimeter Preamp System Test Complete	6/14/00	3/31/00	10.4 w
	M3-Calorimeter CC, ECN Preamp Installation Complete	7/20/00	3/31/00	15.4 w
	Timing System Installed	9/1/00	8/18/00	2 w
	Daughterboard Vendor Production Complete	10/4/00	6/16/00	15.2 w
	BLS Motherboard Assembly Complete	11/22/00	8/7/00	15.2 w
	M2-Calorimeter BLS Assembly Complete	1/8/01	9/26/00	13.6 w

Areas of Concern

Technical

The noise in the BLS system is larger than anticipated, and its source is not yet understood. Tests are continuing.

Schedule

- Unless the BLS noise issue is resolved soon, we may incur additional delays in the production of the BLS system. Since the electronics can be installed after the detector rolls in, these delays do not have any impact on the roll-in.
- We have installed a prototype cooling system for the preamps. The installation is quite complicated and may require additional manpower to install it this summer. There is a significant amount of shop work required to build the cooling system parts which we anticipate will be completed on schedule; however, we continue to monitor that situation closely.
- The preamp motherboard assembly has been delayed because of vendor parts problems. These are being resolved.

Resources

We have just lost one contract technician who has quit, and an employee that has retired. Both of these positions are in the process of being filled, but we may incur delays until these positions are filled. We anticipate hiring an additional student technician for the summer from University funds because this support is unavailable at Fermilab.

Cost

Some additional parts are required for the BLS production. One is no longer available. The cost impact is as yet unknown, but we are optimistic that it can be accommodated within the present cost estimate. A small cost overrun in WBS 1.2.1.1.3.2 was offset by savings in 1.2.1.2.8.1.

Change Requests

None

Progress Summary

- Tests of the BLS noise performance are underway.
- The prototype cooling system for the preamp boxes has been installed, and the air manifold design is being optimized.
- Construction of the balance of the cooling systems (24) is underway.
- About 900 (of 1250) preamp motherboards have been populated and tested.
- 80 (of 500) pre-production BLS daughtercards have been assembled and tested. The balance is expected shortly.
- A final design BLS power supply is being installed in the detector for final full testing.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

- We continue to work with the online, controls and commissioning group to bring up the DAQ and required controls for our infrastructure.
- Calibration system power supplies are under construction.
- We continue to prepare the documentation for the BL system safety review.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Intercryostat Detector
WBS: 1.2.2
Date Submitted: 5/23/00
Submitted By: Andy White

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	M3-ICD Tile Modules/Boxes Ready	4/19/00	1/18/00	13.2 w
X	M2-ICD Modules Arrive at Fermilab	4/24/00	1/25/00	12.8 w
X	M3-InterCryostat Detectors Installed	5/5/00	2/1/00	13.6 w
	Drawers Ready	7/21/00	12/14/99	29.2 w

Areas of Concern

Technical

We believe we have found a company that can make our fiber cables, but we still need to see a viable prototype.

Schedule

- Need to develop a detailed installation plan for the backplanes and fiber cables.
- Awaiting the light mixing boxes (LMBs) that are being made for the ICD as part of an arrangement with the muon system.

Resources

None

Cost

- Final fiber cable costs are still unknown.
- The MOU addenda for University of Texas-Arlington and Louisiana Tech have been submitted for the remaining ICD budgeted items.

Change Requests

None

Progress Summary

- All the supertile modules were delivered to Fermilab and successfully installed on the North and South end-calorimeter cryostats.
- All the motherboards were produced and 50% were stuffed.
- Procedures have been developed for fabricating the fiber backplanes.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Muon Central
WBS: 1.3.2
Date Submitted: 5/8/00
Submitted By: Tom Diehl

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
	PDT Commissioning Complete	10/17/00	6/9/00	18 w
	CFA Commissioning Complete	11/1/00	7/10/00	16.3 w

Areas of Concern

Technical

- Progress continued to be slow on the two central muon gas systems. The on-detector components have been leak-tested but we are not yet using them to flow gas. The piping that will run from the detector to the gas room has been ordered.
- We continue to be limited in the number of operating WAMUS PDTs because of lack of final version Control Boards. The electronics engineer is working on the software encoded in the on-board digital signal processors. It is hoped that we will overcome these problems shortly. We plan to be operating six of the 94 PDTs by mid-May.
- We continue to be limited in the number of Cosmic Cap, Cosmic Bottom, and A- ϕ scintillation counters we can operate because of the limited number of SRCs and SFEs. We are limited to commissioning one crate of electronics.

Schedule

CFA counter commissioning has commenced.

Resources

A bit of the pressure due to the previously small number of physicists available for commissioning the three detector systems has been relieved. A physicist from TIFR (Bombay, India) has arrived recently. Two physicists from ITEP (Moscow, Russia) have arrived. The roster for April included 4.75 FTEs, up from 3.9 the previous month. Still, there are no post-docs.

Cost

None.

Change Requests

None.

Progress Summary

Substantial progress was made in installing front-end electronics for the A-layer PDT system. It is important to finish this as soon as possible because of PDT access issues when the fiber tracker and silicon detectors arrive for installation.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Muon Forward Trigger Detectors
WBS: 1.3.3
Date Submitted: 5/2/00
Submitted By: Dmitri Denisov

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	M2-Muon Forward Trigger Counter Assembly 10% Complete	10/12/98	10/12/98	0 w
X	All Pixel Octants Assembled	2/23/00	4/4/00	-5.8 w
	All Muon Forward Trigger Detector Planes Installed	11/29/00	8/25/00	13 w

Areas of Concern

Technical:

None

Schedule:

Installation of supports for holding A-layer planes is delayed, due to unavailability of drawings.

Resources:

Mechanical engineering manpower shortfall created schedule delays (see above).

Cost:

None

Change Requests:

None

Progress Summary:

All octants are assembled, tested, and ready for installation. During April, engineering efforts were concentrated on finishing design of A-layer planes supports. High-voltage system commissioning has started at DØ as well as preparation for VME front-end crates installation and commissioning.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Muon Forward Tracker
WBS: 1.3.4
Date Submitted: 5/2/00
Submitted By: Dmitri Denisov

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	M2-Muon Forward Tracker MDT Assembly 10% Complete	1/29/99	1/29/99	0 w
X	Arrival Of C-Layer MDT Modules At FNAL	11/3/99	10/22/99	1.7 w
X	M2-All Muon Forward Tracker MDT Modules At Fermilab	3/30/00	3/10/00	2.8 w
	B-Layer Octants Assembled	8/11/00	4/18/00	16.2 w
	All MDT Octants Assembled	8/11/00	7/14/00	4 w
	Muon Forward Tracker B-Layer Planes Installed	11/6/00	6/15/00	20 w
	All MDT Planes Installed	11/6/00	8/4/00	13 w

Areas of Concern

Technical:

None

Schedule:

Modifications to the forward shielding caused delays in the A-layer octant installation. Delays in the delivery of parts from the vendor and the lower-than-requested number of Fermilab techs at Lab F has caused a delay in ramping up the assembly rate for MDT C-layer octants.

Resources:

Fermilab technician manpower in Lab F is below the requested and approved number (see above).

Cost :

None

Change Requests:

None.

Progress Summary:

- A-layer octants are fully tested and eight of them were safely delivered to DØ for installation.
- All the mounting hardware for the A-layer octants has been installed and load-tested.
- A considerable amount of preparation work (production and drilling of frames, tube installation, etc.) has been done at Lab F for C-layer octant assembly, and two C-layer octants have been partly assembled.
- 70% of the B-layer tubes have been tested at Lab F.
- VME-based test setups for octant tests at DØ have been assembled and are ready for use.
- Commissioning of the MDT high-voltage system has started.
- Design of the C-layer MDT supports was finished.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Muon Electronics
WBS: 1.3.5
Date Submitted: 05/22/00
Submitted By: Boris Baldin

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	MDT ADB Fabrication Complete	12/2/99	12/2/99	0 w
X	MDC Fabrication Complete	1/31/00	12/13/99	5 w
X	M2-Muon Electronics Preproduction Installation Complete	1/31/00	12/13/99	5 w
X	FEB, CB Production Complete	4/10/00	1/3/00	14 w
	MRC, MFC Production Complete	5/24/00	3/27/00	8.4 w
	SFE, SRC Fabrication Complete	5/30/00	2/3/00	16.5 w

Areas of Concern

Technical

None

Schedule

None

Resources

None

Cost

None

Change Requests

None

Progress Summary

Twenty-five scintillator front end cards (SFES) were received from the vendor at the end of April (out of the thirty that were expected). The boards in production are SFE, SLP, TFC and MDT readout card (MDRC).

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Trigger
WBS: 1.4.1-1.4.5
Date Submitted: 5/18/00
Submitted By: Gerald C. Blazey and Nikos Varelas

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	SLICs Received	12/10/99	11/10/99	4 w
X	M3-Establish Single Crate Internal Data Movement	2/17/00	1/6/00	6 w
	Preproduction MTCxx, MTFB, and MTCM Complete	5/1/00	1/24/00	14 w
	M3-L3 Operational (One Full Chain)	6/29/00	6/1/00	4 w
	MBTs Received	6/30/00	3/16/00	15 w
	M3- Cal Readout Available to L2	8/15/00	2/11/00	26 w
	Global Installation Complete	9/7/00	7/12/00	8 w
	L2 Cal Installation Complete	9/7/00	8/21/00	2.4 w
	L2 CTT Installation Complete	9/7/00	8/9/00	4 w
	L2 Muon Installation Complete	9/21/00	7/26/00	8 w
	Production MTCxx, MTFB, and MTCM Complete	10/5/00	6/27/00	14 w
	M3-Muon Level 1 Trigger Preproduction Testing Complete	10/20/00	4/18/00	26 w
	Alpha Cards Received	12/18/00	5/15/00	30 w
	M3-Trigger Level 2 Commissioned	1/26/01	9/21/00	17 w

Areas of Concern

Technical

The Multi-chip Module (MCM) noise levels were shown to be sufficient for 396 nsec running, and work continued on optimizing the MCM performance. Problems with the pre-production Level 2 Alpha off-chip cache have been traced to poor board layout. Strategies for proceeding were explored and a decision target of early May selected. The source of transmission errors between Level 1 muon cables and the Level 2 muon crate remained under study and a plan for proceeding selected.

Schedule

A significant delay of the Level 1 Cal system was reported. To avoid commissioning delay, it was determined that a portion of the system would be installed earlier. This will support commissioning of Level 2 and Level 3 filtering. The Level 2 Alphas and Magic Bus Transceivers (MBTs) were also reported to have fallen behind schedule, prompting study of the Level L2 schedule.

Resources

Key personnel will leave the Level 1CTT/CPS VHDL task shortly. Efforts to replace the lost expertise with personnel reassignment within DØ and with additional resources from outside DØ began. An engineer is needed to help with the commissioning phase of the Level 2 system.

Cost

None

Change Requests

None

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Progress Summary

Framework

Many small tasks necessary for final commissioning of the Level 1 and Level 2 Frameworks were completed.

Luminosity Monitors

The design of luminosity monitor electronics continued, as did preparation of the luminosity monitors for installation in May.

Level 1

- Tests of Level 1 muon pre-production modules continued during the month, and excellent progress was made integrating Level 1 muon modules into the DAB DAQ system.
- Test of the Level 1 CTT/CPS AFE prototype shows improved noise characteristics.
- The first article MCM's arrived.
- Work continued on the digital electronics and VHDL coding.

Level 2

- We now have pre-production models of all Level 2 cards and are performing integration tests with the muon system and among the Level 2 components at the Level 2 test stand. Tests on the FIC and MBT are furthest advanced.
- We are studying questions on the interaction of the SLIC, CIC, and SFO.
- The Level 2 Alpha pre-production board has one issue holding its release for production. The third-level cache between memory and CPU is unreliable due to layout problems. Timing tests on preprocessor code indicate that the on-chip second-level cache is sufficient, with only 2% degradation in time per event. Similar tests with a prototype of Global are also positive, but do not yet constitute a sufficient test to allow building all Level 2 Alpha boards.
- Cables for the Level 2 trigger have been ordered.
- Significant progress was made in the software infrastructure for the Level 2 trigger, including work that simplifies the incorporation of both Level 1 and Level 2 algorithms in the new Trigger Simulation Framework, and releasing effort for more direct contributions to Level 2 Global coding.
- New manpower expressed interest in working on muon algorithms.
-

Level 3

- Progress on the Level 3/DAQ hardware highlighted increasingly reliable operation of the entire readout chain.
- Excellent progress was made in bringing online the DAQ system at Brown. That system is now being used to develop and extend code used to control and operate the Level 3 system.
- Progress on the Level 3 filtering continued on all fronts.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Subsystem: Online
WBS: 1.5.1
Date Submitted: 5/23/00
Submitted By: Stuart Fuess

<u>Done</u>	<u>Reportable Milestone</u>	<u>Date</u>	<u>Baseline</u>	<u>Variance</u>
X	Steady DAQ Running	3/17/00	3/31/00	-2 w

Areas of Concern

Technical

None

Schedule

None

Personnel

None

Cost

None

Change Requests

None

Progress Summary

Following the successful achievement of a 3/31/00 milestone, the Online group has concentrated on a new series of tasks related to a 5/19/00 commissioning milestone. For this upcoming milestone we have the following goals:

- *Operation with multiple simultaneous DAQ runs.* This is an important commissioning tool, allowing several detector groups to operate independently and simultaneously. This includes the ability to write data to multiple independent output streams.
- *Operation of a first instance of the Calibration system.* This phase is aimed at the readout crates containing front end processors, which includes the SMT, CFT, CPS, and FPS. The calibration process includes COOR control of the procedure, readout of a crate by a front end processor, accumulation of statistics in the front end, report of the results to a host calibration manager process, validation of the results, logging of the results to an ORACLE database, and later retrieval of the logged information.
- *Transport of database information to Offline computing systems.* The Online ORACLE database is loaded with a diverse set of data both directly related to event DAQ and indirectly associated with the operation of the experiment. Specific database schemas have been developed for run, calibration, luminosity, and monitoring information. Much of this information must be propagated to the Offline analysis systems. Our 5/19/00 milestone goal is to demonstrate the “advanced queueing” mechanism by which data in the Online ORACLE database is propagated to the Offline systems.
- *Commissioning of the Significant Event (Alarm) system.* DØ will enhance the monitoring capability already built in to the EPICS control system with a higher-level alarm system. Software generated alarms will also be supported, allowing any DAQ process, in the trigger system or on the host, to generate alarms. The milestone goal is to produce the first versions of the Significant Event Server, the central piece of the entire system, a prototype Significant Event Display, an API for software applications, and control and commissioning tools for the system.

Continuing activities:

The Online group continues to staff M-F 9-5 commissioning shifts.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

April '00 Financial Summary

The month of April fiscal year 2000 closed with obligations for the DØ Upgrade Project totaling \$3,077K on equipment M&S funds and \$37K on Solenoid AIP Plant funds. The current spending plan, which continues to show that spending is equal to plan for FY00, has been downloaded from the current Project schedule. Because the latest version of the Upgrade Project Cost Estimate still needs to be loaded into the Project's schedule, the probability for changes to this spending plan is high. The Project was allocated an M&S budget of \$3,104K during November. To cover Operating expenditures, the M&S budget was reduced by \$400K early in the fiscal year and an additional \$200K reduction occurred during April. DØ expects to spend the full FY00 budget, which is now \$2,504K. In addition to the Project's DoE funding, forward funding will be instituted to cover expenditures beyond the current fiscal year budget. A \$1,000K forward funding agreement has recently been established with SUNY Stony Brook. Michigan State has also agreed to provide support, but the dollars and paperwork have not yet been finalized. The remaining DoE funding of \$1,020K will be allocated during fiscal year 2001.

The M&S Upgrade Project balance is currently \$4,527K, excluding contributions and contingency. Contributions to the Upgrade currently total \$1,442K. These contributions reduce the M&S balance. DØ Upgrade Spokespersons are in the process of negotiating additional contributions of approximately \$385K, but at this time, these funds are still unspecified. A new Cost Estimate is now being used in the determination of Project's estimate to complete (ETC), which remains equal to the Project's M&S balance. The overall cost of the Project has increased. A contingency estimate was developed as a result of a Particle Physics Division Cost Review, which took place during March. The contingency, which is held by the Directorate, further increases the total Project cost. The total Cost Estimate increased by \$71K during April as a result of contingency usage requests approved by the Directorate.

The balance in AIP funds is \$282.4K. The Solenoid Project is now complete. The unobligated AIP balance will be transferred to Upgrade M&S Equipment as budget dollars to be spent this fiscal year. The Solenoid Project should close prior to the end of May FY00 and thus, the budget dollars are expected to be transferred in June FY00.

The Project currently has commitments with universities and other institutions in the DØ Collaboration, via active Memoranda of Understanding (MoU), totaling \$4,915K. These funds represent an obligation on the part of the DØ Upgrade Project and are regularly costed each month via invoices received from these institutions as work is completed. In addition, several institutions have made significant contributions to the DØ Upgrade. A list of the universities and other institutions involved, as well as a more detailed breakdown of the commitments and costs, follows.

DØ Upgrade Monthly Progress Report

for the month of April, 2000

FY00 Financial Report as of 4/30/00

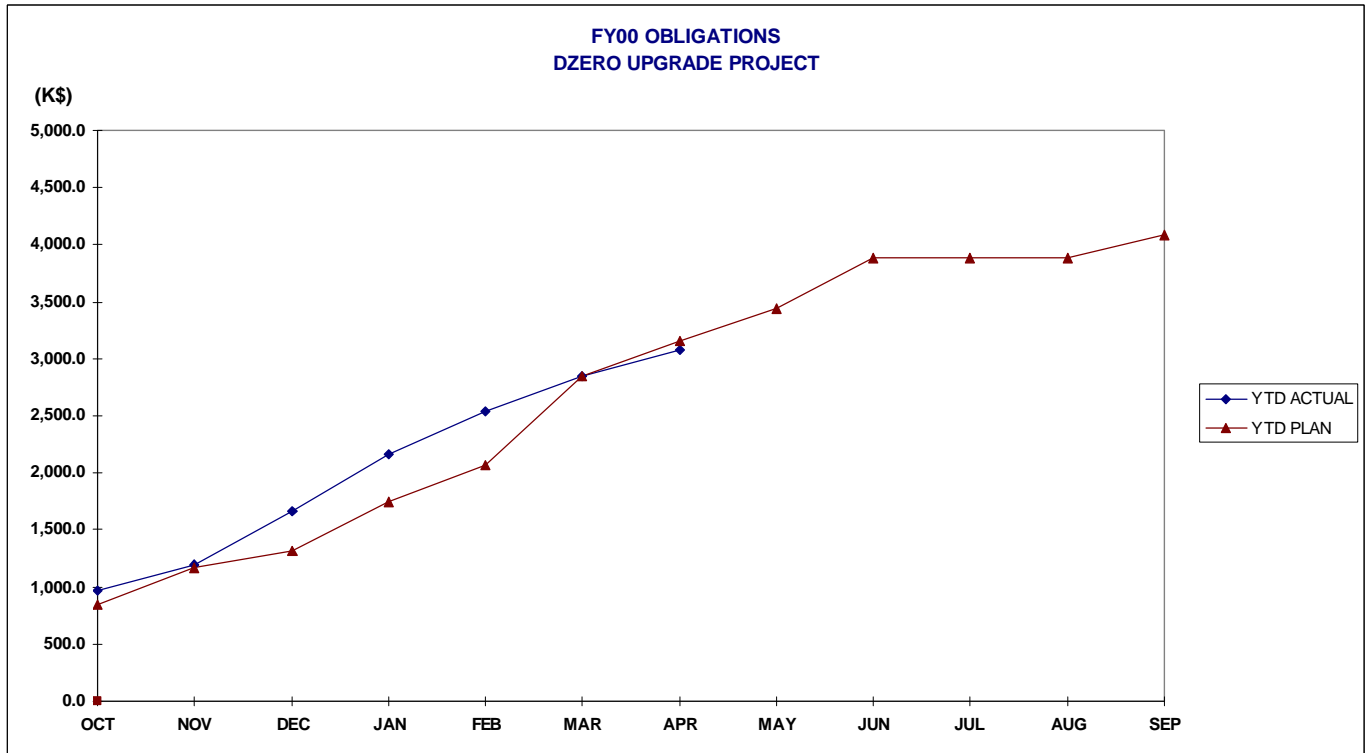
	<u>COST ESTIMATE</u>	<u>PRIOR YR OBLIG</u>	<u>FY 00 YTD OBLIG</u>	<u>PROJECT BALANCE</u>
1 TOTAL DZERO UPGRADE PROJECT	41,593.2	33,989.2	3,077.4	4,526.7
1.1 TRACKING DETECTORS	20,097.6	16,773.0	2,136.7	1,187.9
1.1.1 SILICON TRACKER	7,857.1	6,166.1	1,107.0	583.9
1.1.2 FIBER TRACKER	7,774.3	6,976.3	594.9	203.1
1.1.3 CENTRAL PRESHOWER DETECTOR	238.2	228.2	0.0	10.0
1.1.4 FORWARD PRESHOWER DETECTOR	524.3	500.3	14.1	9.9
1.1.5 TRACKING ELECTRONICS	3,703.7	2,902.1	420.7	380.9
1.2 CALORIMETER	4,656.8	4,163.4	65.4	428.0
1.2.1 FRONT-END ELECTRONICS	4,347.6	3,915.5	61.1	371.0
1.2.2 INTERCRYSTAT DETECTOR	309.2	247.9	4.3	57.1
1.3 MUON DETECTORS	9,498.3	7,839.9	573.5	1,084.9
1.3.1 COSMIC RAY SCINTILLATOR	1,223.2	963.2	0.0	260.0
1.3.2 CENTRAL TRIGGER DETECTORS	951.9	713.6	61.8	176.6
1.3.3 FORWARD TRIGGER DETECTOR	2,133.3	1,673.1	26.3	433.9
1.3.4 FORWARD TRACKING DETECTOR	1,410.8	953.8	331.3	125.7
1.3.5 FRONT-END ELECTRONICS	3,779.1	3,536.2	154.1	88.8
1.4 TRIGGER	6,594.5	4,919.5	163.9	1,511.1
1.4.1 FRAMEWORK	1,859.4	1,859.4	0.0	0.0
1.4.2 LEVEL 0	136.4	124.2	6.1	6.1
1.4.3 LEVEL 1	1,502.6	1,120.0	49.5	333.1
1.4.4 LEVEL 2	2,047.1	1,002.3	99.0	945.8
1.4.5 LEVEL 3	1,049.0	813.7	9.3	226.0
1.5 ONLINE EQUIPMENT	746.0	293.4	137.9	314.8
1.5.1 ON-LINE EQUIPMENT	746.0	293.4	137.9	314.8
3.1 TOTAL SOLENOID PROJECT	5,168.0	4,848.2	37.4	282.4
3.1.1 SOLENOID	5,168.0	4,848.2	37.4	282.4

DEFINITION OF TERMS:

Funds: DØ Upgrade = M&S Equipment Funds; Solenoid = AIP Plant Funds.
 Cost Estimate: Total Project and Sub-Project Budgets without contingency.
 Prior Year Obligations: Obligations for fiscal years '92 through '99 as applicable.
 FY 00 Year-to-Date Obligations: Obligations for fiscal year '00.
 Project Balance: Cost Estimate - (Prior Year Obligations + Fiscal 00 YTD Obligations)
 DØ FY 00 Plan: The M&S funds allocated to the Project/Sub-Projects as extracted from the current schedule.
 DØ FY 00 Balance: DØ FY 00 Plan - FY 00 Year-to-Date Obligations

DØ Upgrade Monthly Progress Report

for the month of April, 2000



	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
YTD ACTUAL	962.6	1,199.8	1,664.6	2,169.3	2,546.1	2,855.8	3,077.4					
YTD PLAN	843.0	1,164.0	1,316.0	1,754.0	2,076.0	2,845.0	3,158.0	3,439.0	3,884.0	3,884.0	3,884.0	4,086.0

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Active MOUs as of 4/30/00

<u>INSTITUTION</u>	<u>EQUIPMENT</u>	<u>R&D</u>	<u>COSTED</u>
Boston University	298,200	5,200	35,093
Brookhaven National Laboratory	236,439		180,988
Brown University	820,076	106,000	161,319
California State University, Fresno	26,160		4,083
Columbia University, Nevis Labs	140,000		107,937
DAPNIA / Saclay	0	0	0
IN2P3	0	0	0
Indiana University	65,000		31,585
Institute for High Energy Physics (IHEP)	270,433		107,838
Kansas State University	113,300	92,512	68,518
Louisiana Tech University	80,854		52,428
Michigan State University	226,087		68,744
Moscow State University	23,250		0
NIKHEF / Amsterdam	0	0	0
Northern Illinois University	133,000	28,000	103,600
SUNY at Stony Brook	1,105,750	20,000	490,133
University of Arizona	820,598	78,100	474,299
University of Calif, Davis		9,720	0
University of IL, Chicago	129,103	22,000	91,042
University of Kansas, Center for Research, Inc.	16,000		1,889
University of Maryland	0		0
University of Nebraska, Lincoln	0		0
University of Notre Dame	190,500	77,000	102,097
University of Oklahoma	43,000		30,085
University of Texas, Arlington	126,764		114,268
<u>University of Washington</u>	<u>50,640</u>	<u>5,250</u>	<u>38,538</u>
Total Fermilab Funds:	<u>\$4,915,154</u>	<u>\$443,782</u>	
Total Costed:	2,047,706	216,777	<u>\$2,264,483</u>
Total Open Commitments:	<u>\$2,867,448</u>	<u>\$227,005</u>	

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Reportable Milestones Summary

<u>Done</u>	<u>Reportable Milestones</u>	<u>Project</u>	<u>Date</u>	<u>Baseline</u>	<u>Var.</u>
X	M1-Solenoid Delivered to Fermilab	Solenoid	5/12/97	5/12/97	0 w
X	M2-VLPC Production 50% Complete	VLPCs	8/31/97	8/31/97	0 w
X	M2-Central Preshower Module Fabrication Complete	Central Preshower	12/16/97	12/16/97	0 w
X	M2-Central Preshower Installed on Solenoid	Central Preshower	5/21/98	5/21/98	0 w
X	M1-Solenoid Installed and Tested	Solenoid	9/30/98	9/30/98	0 w
X	M2-Muon Forward Trigger Counter Assembly 10% Complete	Muon Forward Trigger	10/12/98	10/12/98	0 w
X	M2-Forward Preshower Module Fabrication Begun	Forward Preshower	11/4/98	11/4/98	0 w
X	M2-Muon Forward Tracker MDT Assembly 10% Complete	Muon Forward Tracker	1/29/99	1/29/99	0 w
X	M2 - Assembly Design Complete	Fiber Tracker	3/5/99	3/5/99	0 w
X	M2-First Cylinder Complete	Fiber Tracker	9/2/99	9/2/99	0 w
X	H Half-Wedge Fabrication 20% Complete	Silicon Tracker	10/15/99	10/15/99	0 w
X	3 Chip Ladder Fabrication 80% Complete	Silicon Tracker	10/26/99	10/20/99	0.6 w
X	Arrival Of C-Layer MDT Modules At FNAL	Muon Forward Tracker	11/3/99	10/22/99	1.7 w
X	9 Chip Ladder Fabrication 20% Complete	Silicon Tracker	11/4/99	11/3/99	0.2 w
X	M3-Fiber Tracker Ribbon Fabrication 50% Complete	Fiber Tracker	11/5/99	11/12/99	-0.9 w
X	First Readout Crate Installed & Working	Silicon Electronics	11/16/99	12/2/99	-2 w
X	SCA Testing Complete	Calorimeter Electronics	11/23/99	12/15/99	-2.8 w
X	MDT ADB Fabrication Complete	Muon Electronics	12/2/99	12/2/99	0 w
X	SLICs Received	Trigger	12/10/99	11/10/99	4 w
X	F Wedge Assemblies 20% Complete	Silicon Tracker	1/24/00	1/19/00	0.4 w
X	6 Chip Ladder Fabrication 20% Complete	Silicon Tracker	1/31/00	1/3/00	3.9 w
X	MDC Fabrication Complete	Muon Electronics	1/31/00	12/13/99	5 w
X	M2-Muon Electronics Preproduction Installation Complete	Muon Electronics	1/31/00	12/13/99	5 w
X	M2-Fiber Tracker Assembly Begun	Fiber Tracker	2/1/00	12/6/99	6.2 w
X	M3-Establish Single Crate Internal Data Movement	Trigger	2/17/00	1/6/00	6 w
X	Shaper Hybrid 50% Complete	Calorimeter Electronics	2/22/00	5/9/00	-11.1 w
X	All Pixel Octants Assembled	Muon Forward Trigger	2/23/00	4/4/00	-5.8 w
X	M3-1st Forward Preshower Detector Complete	Forward Preshower	2/24/00	1/12/00	6.2 w
X	M3-Fiber Tracker Cylinders 8, 7, 6, and 5 Complete	Fiber Tracker	3/2/00	1/28/00	5 w
	Waveguide Production 50% Complete	Fiber Tracker	3/16/00	1/29/00	6.8 w
X	Steady DAQ Running	Online	3/17/00	3/31/00	-2 w
X	H Half-Wedge Fabrication 80% Complete	Silicon Tracker	3/29/00	2/23/00	5 w
X	M2-All Muon Forward Tracker MDT Modules At Fermilab	Muon Forward Tracker	3/30/00	3/10/00	2.8 w
X	Module Fabrication and Testing Complete	Forward Preshower	4/1/00	12/10/99	14 w
X	M3-2nd Forward Preshower Detector Complete	Forward Preshower	4/3/00	3/8/00	3.6 w
X	"FEB, CB Production Complete"	Muon Electronics	4/10/00	1/3/00	14 w
X	M3-ICD Tile Modules/Boxes Ready	Intercryostat Detector	4/19/00	1/18/00	13.2 w
X	M2-ICD Modules Arrive at Fermilab	Intercryostat Detector	4/24/00	1/25/00	12.8 w
	Preproduction MTCxx, MTFB, and MTCM Complete	Trigger	5/1/00	1/24/00	14 w
X	M3-InterCryostat Detectors Installed	Intercryostat Detector	5/5/00	2/1/00	13.6 w
X	M3-Level Ø-South Installed	Luminosity Monitor	5/8/00	2/9/00	12.6 w
X	M3-Fiber Tracker Ribbon Fabrication Complete	Fiber Tracker	5/10/00	3/6/00	9.5 w
X	M3-Fiber Tracker Ribbon Mounting Complete	Fiber Tracker	5/13/00	4/20/00	3.3 w
	M2-Fiber Tracker Assembly Complete	Fiber Tracker	5/24/00	5/4/00	2.9 w
	MRC, MFC Production Complete	Muon Electronics	5/24/00	3/27/00	8.4 w
	SFE, SRC Fabrication Complete	Muon Electronics	5/30/00	2/3/00	16.5 w
	Multichip Modules Received	Fiber Electronics	6/1/00	2/23/00	14 w
	M3-VLPC Cassette Assembly 50% Complete	VLPCs	6/5/00	4/12/00	7.4 w
	M2-Calorimeter Preamp System Test Complete	Calorimeter Electronics	6/14/00	3/31/00	10.4 w
	F Wedge Assemblies 80% Complete	Silicon Tracker	6/20/00	4/26/00	7.6 w
	9 Chip Ladder Fabrication 80% Complete	Silicon Tracker	6/27/00	3/27/00	13 w
	M2-First Silicon Tracker Barrel/Disk Module Complete	Silicon Tracker	6/28/00	1/24/00	22.2 w

DØ Upgrade Monthly Progress Report

for the month of April, 2000

Ten 8-chip Analog Boards Available	Fiber Electronics	6/29/00	4/19/00	10 w
M3-L3 Operational (One Full Chain)	Trigger	6/29/00	6/1/00	4 w
MBTs Received	Trigger	6/30/00	3/16/00	15 w
M3-VLPC Cryo System Operational	VLPCs	7/7/00	6/12/00	3.6 w
6 Chip Ladder Fabrication 80% Complete	Silicon Tracker	7/12/00	3/14/00	16.8 w
M3-Calorimeter CC,ECN Preamp Installation Complete	Calorimeter Electronics	7/20/00	3/31/00	15.4 w
Drawers Ready	Intercryostat Detector	7/21/00	12/14/99	29.2 w
M2-Muon End Toroids Installed on Platform	Master	7/27/00	11/15/00	-15.4 w
M3-Waveguide Production Complete	Fiber Tracker	8/2/00	6/5/00	8.4 w
South H-Disks Ready to Move to DAB	Silicon Tracker	8/4/00	7/3/00	4.6 w
South Half-Cylinder Complete and Ready to Move to DAB	Silicon Tracker	8/10/00	8/1/00	1.6 w
10 Digital Boards Available	Fiber Electronics	8/11/00	3/22/00	20 w
B-Layer Octants Assembled	Muon Forward Tracker	8/11/00	4/18/00	16.2 w
All MDT Octants Assembled	Muon Forward Tracker	8/11/00	7/14/00	4 w
M3- Cal Readout Available to L2	Trigger	8/15/00	2/11/00	26 w
Timing System Installed	Calorimeter Electronics	9/1/00	8/18/00	2 w
Global Installation Complete	Trigger	9/7/00	7/12/00	8 w
L2 Cal Installation Complete	Trigger	9/7/00	8/21/00	2.4 w
L2 CTT Installation Complete	Trigger	9/7/00	8/9/00	4 w
L2 Muon Installation Complete	Trigger	9/21/00	7/26/00	8 w
Daughterboard Vendor Production Complete	Calorimeter Electronics	10/4/00	6/16/00	15.2 w
Production MTCxx, MTFB, and MTCM Complete	Trigger	10/5/00	6/27/00	14 w
M3-VLPC Cassette Assembly Complete	VLPCs	10/13/00	8/22/00	7.4 w
PDT Commissioning Complete	Muon Central	10/17/00	6/9/00	18 w
M3-Muon Level 1 Trigger Preproduction Testing Complete	Trigger	10/20/00	4/18/00	26 w
M3-All Silicon Tracker Barrels/Disks Complete	Silicon Tracker	10/27/00	8/25/00	9 w
North Half-Cylinder Complete and Ready to Move to DAB	Silicon Tracker	10/27/00	9/18/00	6 w
M1-Central Silicon Complete	Silicon Tracker	10/27/00	9/18/00	6 w
M1-Begin Shield Wall Removal/Ready to Roll-in	Master	11/1/00	11/22/00	-3 w
CFA Commissioning Complete	Muon Central	11/1/00	7/10/00	16.3 w
Mixer Boards Ready	Fiber Electronics	11/3/00	6/22/00	18.8 w
Muon Forward Tracker B-Layer Planes Installed	Muon Forward Tracker	11/6/00	6/15/00	20 w
All MDT Planes Installed	Muon Forward Tracker	11/6/00	8/4/00	13 w
BLS Motherboard Assembly Complete	Calorimeter Electronics	11/22/00	8/7/00	15.2 w
All Muon Forward Trigger Detector Planes Installed	Muon Forward Trigger	11/29/00	8/25/00	13 w
Alpha Cards Received	Trigger	12/18/00	5/15/00	30 w
M2-Silicon Tracker Installed in Solenoid/Fiber Tracker	Silicon Tracker	12/19/00	9/25/00	12 w
M2-Calorimeter BLS Assembly Complete	Calorimeter Electronics	1/8/01	9/26/00	13.6 w
M3-Trigger Level 2 Commissioned	Trigger	1/26/01	9/21/00	17 w
M1-Detector Rolled-in and Hooked Up	Master	2/1/01	2/2/01	-0.2 w